



QUALIFICATION FILE

Electrolyzer Manufacturing Plant Technician

Short Term Training (STT) Long Term Training (LTT) Apprenticeship

Upskilling Dual/Flexi Qualification For ToT For ToA

General Multi-skill (MS) Cross Sectoral (CS) Future Skills OEM

NCrF/NSQF Level: 4

Submitted By:

Skill Council for Green Jobs

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Section 1: Basic Details

1. Qualification Name	Electrolyzer Manufacturing Plant Technician		
2. Sector/s	Environmental Science		
3. Type of Qualification: <input checked="" type="checkbox"/> New <input type="checkbox"/> Revised <input type="checkbox"/> Has Electives/Options <input type="checkbox"/> OEM	NQR Code & version of existing/previous qualification: Not Applicable	Qualification Name of existing/previous version: Not Applicable	
4. a. OEM Name b. Qualification Name (Wherever applicable)	Not Applicable		
5. National Qualification Register (NQR) Code &Version	QG-05-ES-02028-2024-V1-SCGJ	6. NCrF/NSQF Level: 4	
7. Award (Certificate/Diploma/Advance Diploma/ Any Other)	Certificate		
8. Brief Description of the Qualification	Electrolyzer Manufacturing Plant technician is responsible for supporting the safe, efficient, and high-quality production of electrolyzer system. Their work is essential to provide technical support to maintain the manufacturing process of electrolyzer and meeting production goals while adhering to safety and environmental standards. He/She plays a vital role in producing and maintaining electrolyzer along with associated subsystems and is accordingly responsible for various electrical components and systems-related tasks within the Electrolyzer manufacturing facility.		
9. Eligibility Criteria for Entry for Student/Trainee/Learner/Employee	a. Entry Qualification & Relevant Experience:		
		S. No.	Academic/Skill Qualification (with Specialization - if applicable)
		1.	12th grade pass or equivalent
		2.	Pursuing 3 rd year of 3 years diploma (Electrical/Mechanical/Chemical) (after 10th)
		3.	Previous relevant Qualification of NSQF Level 3.5
			Required Experience (with Specialization - if applicable)
			NA
			NA
			with 1.5 years of experience in renewable energy/power/energy/hydrogen sector
			with 3 years of experience in renewable energy/power/energy/hydrogen sector
	b. Age:		18

10 Credits Assigned to this Qualification, Subject to Assessment (as per National Credit Framework (NCrF))	14	10. Common Cost Norm Category: I																		
11 Any Licensing requirements for Undertaking Training on This Qualification (wherever applicable)	NA																			
12 Training Duration by Modes of Training Delivery (Specify Total Duration as per selected training delivery modes and as per requirement of the qualification)	<input checked="" type="checkbox"/> Offline <input type="checkbox"/> Online <input type="checkbox"/> Blended <table border="1" data-bbox="609 587 1615 810"> <thead> <tr> <th>Training Delivery Modes</th> <th>Theory (Hours)</th> <th>Practical (Hours)</th> <th>OJT Mandatory (Hours)</th> <th>OJT Recommended (Hours)</th> <th>Total (Hours)</th> </tr> </thead> <tbody> <tr> <td>Classroom (offline)</td> <td>220</td> <td>140</td> <td>60</td> <td></td> <td>420</td> </tr> <tr> <td>Online</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> (Refer Blended Learning Annexure for details)		Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT Mandatory (Hours)	OJT Recommended (Hours)	Total (Hours)	Classroom (offline)	220	140	60		420	Online					
Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT Mandatory (Hours)	OJT Recommended (Hours)	Total (Hours)															
Classroom (offline)	220	140	60		420															
Online																				
13 Aligned to NCO/ISCO Code/s (if no code is available mention the same)	NCO-2015/ 8131.2100 Ammonia Operator/Ammonia Plant Operator																			
14 Progression path after attaining the qualification (Please show Professional and Academic progression)	Vertical Progression: Electrolyzer Plant Manufacturing Supervisor (Level 5.0)																			
15 Other Indian languages in which the Qualification & Model Curriculum are being submitted	Nil																			
16 Is similar Qualification(s) available on NQR-if yes, justification for this qualification	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No																			

17 Is the Job Role Amenable to Persons with Disability	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If "Yes", specify applicable type of Disability: <input checked="" type="checkbox"/> Deaf <input checked="" type="checkbox"/> Hard of Hearing <input checked="" type="checkbox"/> Acid Attack Victims <input checked="" type="checkbox"/> Dwarfism	
18 How Participation of Women will be Encouraged	The programme would be proposed to be incorporated in women ITIs and diploma colleges to train women candidates on the job role. TPs shall be encouraged to onboard at least a certain number of female candidates in each batch	
19 Are Greening/ Environment Sustainability Aspects Covered (Specify the NOS/Module which covers it)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
20 Is Qualification Suitable to be Offered in Schools/Colleges	Schools <input type="checkbox"/> Yes <input type="checkbox"/> No Colleges <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
21 Name and Contact Details of Submitting / Awarding Body SPOC (In case of CS or MS, provide details of both Lead AB & Supporting ABs)	Name: Dr. Praveen Saxena Email: ceo@sscgi.in Contact No.: 9871119101 Website: https://sscgi.in/	
22 Final Approval Date by NSQC: 31 Jan 2024 during 35 th NSQC	23. Validity Duration: 3 years	24. Next Review Date: 31 Jan 2027

Section 2: Module Summary

S. No	NOS/Module Name	NOS/Module Code & Version (if applicable)	Core/Non-Core	NCrF/N SQF Level	Credits as per NCrF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT-Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) (if applicable)
1.	Introduction about the Electrolyzer and its types	SGJ/N4318 Version 1	Core	4	2	40	20			60	40	60			100	18
2.	Identify Electrolyzer Components and Materials	SGJ/N4319 Version 1	Core	4	2	30	30			60	20	30			50	16
3.	Perform Manufacturing Process of Electrolyzer	SGJ/N4320 Version 1	Core	4	3	50	40			90	40	60			100	18
4.	Identify Tools and Tackles used in Electrolyzer Manufacturing Facility	SGJ/N4321 Version 1	Core	4	2	30	30			60	25	25			50	16
5.	Perform Health and safety measures in Electrolyzer manufacturing facility.	SGJ/N4322 Version 1	core	4	1	10	20			30	25	25			50	16
6.	Employability Skills (ES)	DGT/VSQ/N0102			2	60				60	20	30			50	16
7.	On the Job Training				2			60		60						
Duration (in Hours) / Total Marks						220	140			420	170	230			400	100

NOS/s of Qualifications

(In exceptional cases these could be described as components)

Mandatory NOS/s:

Specify the training duration and assessment criteria at NOS/ Module level. For further details refer curriculum document.

Th.-Theory **Pr.**-Practical **OJT**-On the Job **Man.**-Mandatory Training **Rec.**-Recommended **Proj.**-Project

Assessment - Minimum Qualifying Percentage

Minimum Pass Percentage – Aggregate at qualification level: 70% (Every Trainee should score specified minimum aggregate passing percentage at qualification level to successfully clear the assessment.)

Section 3: Training Related

1.	Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)	ITI /Diploma Electrical, Electronics, Civil, Mechanical, Fitter, Instrumentation or a related trade With a minimum 3 years of relevant industry/training experience in renewable energy/power/energy/hydrogen sector OR B.Tech (Civil/Mechanical /Electrical/ Instrumentation / Electronics / Electrical and Electronics Eng.) OR M.Sc With a minimum 2 years of relevant industry/training experience in renewable energy/power/energy/hydrogen sector OR Certified under relevant Craft Instructor Training Scheme (CITS) course
2.	Master Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)	Engineering Graduate or Post Graduate with 5 years of relevant experience in Hydrogen/energy/power sector
3.	Tools and Equipment Required for Training	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (If "Yes", details to be provided in Annexure)
4.	In Case of Revised Qualification, Details of Any Upskilling Required for Trainer	Not Applicable

Section 4: Assessment Related

1.	Assessor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Graduate/Diploma (Technical) with Three years of experience in Junior Technician integrating Power source relevant experience Or Certified under relevant Craft Instructor Training Scheme (CITS) course
2.	Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Engineering Graduate or Post Graduate with 5 years of relevant experience in Hydrogen/energy/power sector

3.	Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Engineering Graduate or Post Graduate with 10 years of relevant experience in Hydrogen/energy/power sector
4.	Assessment Mode (Specify the assessment mode)	Online and offline both
5.	Tools and Equipment Required for Assessment	<input checked="" type="checkbox"/> Same as for training <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (details to be provided in Annexure-if it is different for Assessment)

Section 5: Evidence of the need for the Qualification

Provide Annexure/Supporting documents name.

1.	<p>Latest Skill Gap Study (not older than 2 years) (Yes/No): Preliminary insights on Green Hydrogen sector as part of the skills landscape study undertaken by SCGJ & Sattva Consulting with support from J P Morgan is available on https://sscgj.in/wp-content/uploads/2023/05/Skills-Landscape-for-Green-Jobs-Report.pdf</p> <p>Green hydrogen—produced through renewable resources such as solar and wind—holds significant promise in meeting the world's future energy demands. Hydrogen is widely considered as the prospective fuel for the global economy, contributing to the rapid expansion of a burgeoning new industry.</p> <p>No published skills gap study is available across the green hydrogen value chain in India as this is relatively a new technology segment however a detailed training needs assessment and jobs mapping study is currently being implemented by SCGJ in coordination with The South Asia Regional Energy Partnership (SAREP) which is the flagship regional energy program of the United States Agency for International Development (USAID). This report shall be released by end of Feb 2024.</p>
2.	<p>Latest Market Research Reports or any other source (not older than 2 years) (Yes/No):</p> <p>Yes following key documents are available in the public domain</p> <p>a. National Green Hydrogen Mission: https://mnre.gov.in/img/documents/uploads/file_f-1673581748609.pdf</p> <p>b. https://powermin.gov.in/sites/default/files/Green_Hydrogen_Policy.pdf</p> <p>c. Harnessing Green Hydrogen, NITI Aayog: https://www.niti.gov.in/sites/default/files/2022-06/Harnessing_Green_Hydrogen_V21_DIGITAL_29062022.pdf</p>

	d. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Dec/IRENA_Green_hydrogen_cost_2020.pdf?rev=4ce868aa69b54674a789f990e85a3f00
3.	<p>Government /Industry initiatives/ requirement (Yes/No): Yes, The global energy sector is on a path of rapid decarbonization and green hydrogen is poised to play a vital role for this transformation in energy systems, Scaling up green hydrogen production and utilisation across multiple sectors like power generation, transportation and other hard to abate sectors will be essential to helping global economies achieve net zero emissions and limit global temperature rises to 1.5C. Many major economies including India have declared Green Hydrogen roadmap as part of the climate and clean energy related actions. These measures largely seek to address the technical and financial challenges in scaling up Green Hydrogen generation, enhancing Green Hydrogen use across focus sectors, developing scalable technologies supported by enabling policies and regulations.</p> <p>After the announcement of the Green Hydrogen Mission by the Prime Minister in August 2021 followed by approval by the cabinet on National Green Hydrogen Mission (NGHM) , there has been a serious push on both policy and industry actions on green hydrogen. Leading energy companies including NTPC, Reliance and Adani Group along with several other major companies have forayed into this segment and have already announced mega green hydrogen projects. Cabinet in Jan 2023 approved the National Green Hydrogen mission with an aim to make India a leading producer and supplier of Green Hydrogen in the world. Government of India is set to provide a fillip to the renewable energy sector by making green hydrogen significantly cheaper while also supporting the nascent industry to establish global supply chains. With the National Mission, there is clear focus on government funding and support for R&D, measures for demand creation, financial support for manufacturing and infrastructure development along with creating opportunities for employment and economic development. The Mission targets setting up of at least 5 MMT (Million Metric Tonne) per annum of green hydrogen capacity with an associated renewable energy capacity of about 125 GW by 2030. The targeted production capacity will bring over ₹8 lakh crore in total investments and will result in creation of over 6 lakh jobs across the sector by 2030. Implementation of the Mission is expected to create a large-scale ecosystem for Green Hydrogen production and use in the country which would also provide a huge opportunity for skilling and jobs creation. In alignment with the Mission targets, SCGJ is actively consulting with Key stakeholders like Green hydrogen industry which includes renewable energy developers, electrolyzer manufacturers, Green hydrogen generators etc to identify their evolving skilling requirement and accordingly designing and implementing skilling interventions to ensure that trained and certified candidates are readily available for the industry.</p>
4.	<p>Number of Industry validation provided: As a future job role, 5 industry validations are received for the qualification.</p> <p>The energy transition towards sustainable solutions has put the burgeoning hydrogen economy in the spotlight. Hydrogen is essentially the key to our sustainable future as it will become a decisive factor for ensuring a steady energy supply globally. However, to be successful in delivering on its decarbonization potential while meeting the growing energy needs of the country, the domestic hydrogen sector needs a skilled workforce.</p> <p>National Green Hydrogen Mission (NGHM) present a significant boost for the production, transport, distribution, and use of Green Hydrogen.</p>
5.	<p>Estimated nos. of persons to be trained and employed: Up to 6 lakhs new jobs are expected to be created by 2030 across the Green hydrogen value chain as per the Green Hydrogen Mission. Multiple qualifications across the key segments of the green hydrogen value chain shall be developed as per the</p>

	<p>requirement of the industry. It is expected that up to 5000 technicians shall be trained and gradually employed across new projects every year. Considering that the domestic industry is at a very nascent stage currently and the most of the Green hydrogen generation units in the country as recently announced are mainly under planning stage, targeted skilling activities can be undertaken for priority job roles like for technicians for manufacturing & operating electrolyser system and those would subsequently set up and operate green hydrogen production system.</p> <p>Approx 3 lakhs + jobs are expected to be generated only for meeting the required renewable energy capacity of 125 GW which would be required for powering the Green hydrogen facilities producing at least 5 MT per annum till 2030. Further approx. 3 lakhs jobs are expected to be created for Green Hydrogen Production and approximately 10-20,000 jobs shall also be created across the domestic manufacturing ecosystem for Electrolysers and other key component.</p> <p>SCGJ already has a portfolio of qualifications for performing key installation and O&M functions in various renewable energy projects and it is expected that the new green hydrogen investments will further drive the required skilling and employment opportunities across renewable energy domain. In the short and medium term, Industry will lead the way and Green Hydrogen production plant will also generate significant jobs across plant installation, commissioning and O&M functions, component manufacturing along with various other technical and non-technical roles at various levels. Downstream process including storage, handling, distribution, applications across industries will generate new jobs and Technical opportunities supported with the strong policy framework for the green hydrogen ecosystem, along with the robust standards and regulations framework for the sector.</p> <p>In the medium to long term, innovative business models particularly in transport and power sectors will evolve in the coming decade leading to new opportunities for both jobs and self-employment across various industry clusters. Oil refineries using hydrogen for desulphurization, ammonia production for fertilizers and chemicals industry, treatment of basic metals along with steel industry will create the leading market, skilling and employment opportunities for green hydrogen in the short-medium term. Green hydrogen technologies and applications as alternate energy carrier / vector for industrial process heating, transportation and long duration energy storage will also emerge in the long term possibly creating new opportunities for both skilling and employment.</p> <p>It is important to note that as part of NGHM implementation, SCGJ is actively creating a range of new qualifications & micro-credentials for fresh skilling along with upskilling/reskilling and simultaneously implementing various trainings to ensure that fast growing green hydrogen sector in India has access to trained, certified and skilled workforce.</p>
6.	<p>Evidence of Concurrence/Consultation with Line Ministry/State Departments:</p> <p>Concurrence has been requested from the Ministry of New and Renewable Energy which is the implementing ministry of the National Green Hydrogen Mission (NGHM)</p>

Section 6: Annexure & Supporting Documents Check List

Specify Annexure Name / Supporting document file name

1.	Annexure: NCrf/NSQF level justification based on NCrf level/NSQF descriptors (<i>Mandatory</i>)	Annexure: Evidence of Level
2.	Annexure: List of tools and equipment relevant for qualification (<i>Mandatory, except in case of online course</i>)	Annexure: Tools and Equipment (Lab Set-Up)
3.	Annexure: Detailed Assessment Criteria (<i>Mandatory</i>)	Annexure: Detailed Assessment Criteria (<i>Mandatory</i>)
4.	Annexure: Assessment Strategy (<i>Mandatory</i>)	Annexure: Assessment Strategy
5.	Annexure: Acronym and Glossary (<i>Optional</i>)	Annexure: Acronym and Glossary
6.	Supporting Document: Model Curriculum (<i>Mandatory – Public view</i>)	Attached
7.	Supporting Document: Career Progression (<i>Mandatory - Public view</i>)	Annexure: Career progression and OM
8.	Supporting Document: Occupational Map (<i>Mandatory</i>)	Annexure: Career progression and OM
9.	Supporting Document: Assessment SOP (<i>Mandatory</i>)	Annexure: Assessment Strategy

Annexure: Evidence of Level

Title/Name of qualification/component: Electrolyzer Manufacturing Plant Technician		Level: 4	
NSQF Domain	Outcomes of the Qualification/Component	How the outcomes relate to the NSQF level descriptors	NSQF Level
Professional Theoretical Knowledge/ Process	<p>The individual is expected to perform assembling/disassembling of electrolyzer unit, operate and do preventive maintenance of the stack assembly unit in Electrolyzer Manufacturing Facility.</p> <p>The individual possesses specialized knowledge of procedures used in both routine and non-routine contexts. They demonstrate a deep understanding of operational procedures relevant to their work. Additionally, they have comprehensive knowledge of time management required for timely delivery and maintaining quality standards across various issues.</p>	<p>The Electrolyzer Manufacturing plant technician would have a knowledge specific to processes of Electrolyzer manufacturing facility</p> <p>The electrolyser manufacturing plant technician must possess specialized knowledge of procedures applicable in both routine and non-routine situations to effectively carry out their duties. They demonstrate a thorough understanding of operational procedures specific to their role. Additionally, they require comprehensive knowledge of time management to ensure timely delivery and uphold quality standards across various aspects of their work. Hence they are pegged at level 4.</p>	4
Professional and Technical Skills/ Expertise/ Professional Knowledge	<p>The individual is expected to exhibit basic skills to identify and use of specific tools required for electrolyzer manufacturing. She/he need to identify problems in the manufacturing of the Electrolyzer and convey message to the associated Technician. The individual can effectively identify the appropriate tools and possesses advanced knowledge of materials in both routine and non-routine situations. They have the necessary operational skills to execute their work with precision and meet estimated timelines. Additionally, they demonstrate the capability to carry out various processes and procedures across familiar and unfamiliar contexts, showcasing adaptability and versatility in their role.</p>	<p>The Job holder is expected to possess factual knowledge and skills to operate Electrolyzer unit, he/she need not to demonstrate troubleshoot activities related to electrolyzer dysfunction. Therefore she/he is placed at level 3.5. The electrolyzer manufacturing technician demonstrates proficiency in identifying the correct tools and possesses advanced knowledge of materials, applicable in both routine and non-routine scenarios across the manufacturing process. They exhibit operational skills essential for precise work execution, ensuring adherence to timelines.</p>	4

Title/Name of qualification/component: Electrolyzer Manufacturing Plant Technician		Level: 4	
NSQF Domain	Outcomes of the Qualification/Component	How the outcomes relate to the NSQF level descriptors	NSQF Level
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	<p>The individual possesses a wide range of employability skills, including understanding career planning, digital proficiency, and financial and legal literacy. They demonstrate effective communication skills, both verbally and in writing. Additionally, they show initiative and leadership qualities. Furthermore, they exhibit advanced literacy and numeracy skills, enhancing their overall competence and employability.</p> <p>The individual is expected to work within a team of one unit i.e Electrolyzer Manufacturing unit, she/he would be have intermediate numeracy skill to read technical sheet of input and output of machineries.</p>	<p>The electrolyzer manufacturing plant technician is required to possess a diverse set of employability skills to excel in their role. Firstly, they must understand career planning to navigate their professional growth effectively within the manufacturing unit. Additionally, they need to be proficient in digital tools and technologies relevant to their work, ensuring efficiency and accuracy in tasks.</p> <p>Furthermore, the technician should have a basic understanding of financial and related matters related to their job to ensure compliance and smooth operations. Effective communication skills, both verbal and written, are crucial for conveying information clearly within the team and with external stakeholders. Moreover, the technician should demonstrate initiative and leadership qualities to take charge of tasks when required and motivate their team members towards achieving common goals. Finally, advanced literacy and numeracy skills are essential, allowing them to comprehend technical specifications and analyze data related to machinery inputs and outputs, contributing to the overall competence and employability of the individual in their role within the electrolyser manufacturing unit.</p>	4

Title/Name of qualification/component: Electrolyzer Manufacturing Plant Technician		Level: 4	
NSQF Domain	Outcomes of the Qualification/Component	How the outcomes relate to the NSQF level descriptors	NSQF Level
Broad Learning Outcomes/ Core Skill	The individual is expected to carryout job in familiar context of specific machineries. He/she able to understand risk and safety guideline with the assembly of Electrolyzer.	<p>The Job holder is expected to be perform required skills with little instruction. She/he not required rigorous training to perform job. Thus, considering the core skills, s/he can be placed at Level 3.</p> <p>Since the individual will have to carry out specialized job and should have clean understanding of safety guideline as output of a Electrolyzer manufacturing system which require necessary safety and follow specified safety guideline. He/she should possess information about associated risk, S/he can't be placed at level 3.5</p> <p>She/he is not required to collect and organize information of the manufacturing facility to prepare solutions. He/she not expected to exhibit core skills to understand socio- political environment. S/he can't be placed at Level 4.</p>	4
Responsibility	The individual is primarily responsible for assembling, manufacturing and operate Electrolyzer unit.	Job Holder is responsible for his/ her own work as s/he has to perform assembling of electrolyzer and responsible in limited context. Considering the responsibilities, the individual can be placed at level 3. Since the individual works as a skilled technician, takes help from assistants and is also able to assist in planning of routine and predictable tasks of Electrolyzer Manufacturing. He/she also share the responsibility of Electrolyzer Manufacturing plant, he/she can't be placed at level 3.5 He/she is not to ensure proper operation of the Electrolyzer unit. She/he is not responsible for passing knowledge and skills to his/ her sub-ordinate. the individual cannot be placed at level 5.	4

Title/Name of qualification/component: Electrolyzer Manufacturing Plant Technician		Level: 4	
NSQF Domain	Outcomes of the Qualification/Component	How the outcomes relate to the NSQF level descriptors	NSQF Level

Annexure: Tools and Equipment (Lab Set-Up)

List of Tools and Equipment

Batch Size: 30

S. No.	Tool / Equipment Name	Specification	Quantity for specified Batch size
1	Small size/demonstration of electrolyser Units	Standard Make	1
2	Personnel Protective Equipment	Standard Make	30
3	, First aid kit, Material Safety Data Sheet, Gas leakage detector, Tool kit, IR Thermometer ,Barometer, Double ended flat spanner, Double ended ring spanner, Wrenches, Combination pliers, Side cutting pliers, Nose pliers, Screw driver, Vanier caliper, hammer, Cutters, Tweezers, Stripping & Crimping Tools, Safety helmet, electronic pressure gauge, clamp meter, multimeter, KOH concentration measuring tools, gas leakage detector, Nose mask, Safety goggles, Ear plug, PVC hand glove, Cotton hand glove, Reflective jacket, Safety Gloves ,Chemical Mask, Leather gloves, flame proof aprons, Flame proof overalls buttoned to neck, Helmets/hard hats, Full body harness, Hand shields, , fire extinguishers, First aid equipment, Safety instruments	Standard Make	2

Classroom Aids

The aids required to conduct sessions in the classroom are: Marker, charts and visual aid, Projector, Laptop;

Annexure: Industry Validations Summary

Provide the summary information of all the industry validations in table. This is not required for OEM qualifications.

S. No	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No	E-mail ID	LinkedIn Profile (if available)
1	Urja Sathi	Anurag Srivastava	CEO	Lucknow	8887521779	ayodhyawaslcorp@gmail.com	
2	Vacen Engineering and Solution Private Ltd.	Vibhuti Nath Pandey	Director	New Delhi	7532086255	Vibhuti.vacen@gmail.com	
3	Danao Green Tech Pvt. Ltd.	Sanjay Danao	Director	Nagpur	9545648496	director@danao.in	
4	Solar Tech Saarthi Pvt. Ltd.	Lucky Aggarwal	MD	Delhi	9711851306	solarsaarthi@gmail.com	
5	Innodust Marketing Pvt. Ltd.	Gourab	CEO	Bhubaneswar	7894412588	Gourab.innodust@gmail.com	

Annexure: Blended Learning

Blended Learning Estimated Ratio & Recommended Tools:

Refer NCVET “Guidelines for Blended Learning for Vocational Education, Training & Skilling” available on:

<https://ncvet.gov.in/sites/default/files/Guidelines%20for%20Blended%20Learning%20for%20Vocational%20Education,%20Training%20&%20Skilling.pdf>

S. No.	Select the Components of the Qualification	List Recommended Tools – for all Selected Components	Offline : Online Ratio
1	<input checked="" type="checkbox"/> Theory/ Lectures - Imparting theoretical and conceptual knowledge	Not Applicable	
2	<input checked="" type="checkbox"/> Imparting Soft Skills, Life Skills, and Employability Skills /Mentorship to Learners		
3	<input checked="" type="checkbox"/> Showing Practical Demonstrations to the learners		
4	<input checked="" type="checkbox"/> Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training		
5	<input checked="" type="checkbox"/> Tutorials/ Assignments/ Drill/ Practice		
6	<input checked="" type="checkbox"/> Proctored Monitoring/ Assessment/ Evaluation/ Examinations		
7	<input checked="" type="checkbox"/> On the Job Training (OJT)/ Project Work Internship/ Apprenticeship Training		

Annexure: Detailed Assessment Criteria

Detailed assessment criteria for each NOS/Module are as follows:

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory	Practical	Project	Viva
SGJ/N4318: Introduction about the Electrolyzer and its types	<i>Basics of electrolysis, electrolysis process and Electrolyzer technology</i>	20	30	-	-
	PC1. describe and demonstrate electrolysis process on a small model	2	6	-	-
	PC2. explain and demonstrate working of electrolytic cell through picture or videos.	2	6	-	-
	PC3. explain and demonstrate laws related to electrolysis.	2	6	-	-
	PC4. discuss in brief various terms associated with Electrolysis Process.	4	-	-	-
	PC5. discuss and illustrate about Electrolyzer technology through pictures and videos	2	6	-	-
	PC6. discuss key aspects and challenges related to electrolyzer manufacturing in India.	2	-	-	-
	PC7. discuss about the factors affecting electrolysis.	3	-	-	-
	PC8. discuss and demonstrate roles of technician in a green Electrolyzer Manufacturing facility	3	6	-	-
	<i>Explain different types of Electrolyzers and technical specification.</i>	20	30	-	-

	PC9. discuss and illustrate the classification of	2	6	-	-
	PC10. discuss and illustrate about alkaline electrolyzer technology along with technical specifications of Alkaline electrolyzer.	3	7	-	-
	PC11. discuss and illustrate about Proton exchange membrane (PEM) electrolyzer with technical specifications.	3	7	-	-
	PC12. discuss and illustrate the technical specifications of Solid oxide electrolysis cell (SOEC) electrolyzer.	3	10	-	-
	PC13. discuss Anion exchange membrane (AEM)	3	-	-	-
	PC14. discuss Pros and Cons of different	3	-	-	-
	PC15. discuss about advancement in Electrolyzer	3	-	-	-
NOS Total		40	60	-	-

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory	Practical	Project	Viva
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SGJ/N4319: Identify Electrolyzer Components and Materials	<i>Materials and components required for Manufacturing Electrolyzer</i>	20	30	-	-
	PC1. explain and illustrate the basic materials and components required for manufacturing Electrolyzer and different types of Materials required for Electrolyzer manufacturing and their key specification through Pictures, videos, product data sheet etc.	2	6	-	-
	PC2. explain the major components required for Alkaline type Electrolyzer. and discuss about each component.	2	-	-	-
	PC3. explain the major components required for PEM type Electrolyzer and discuss about each component	3	-	-	-
	PC4. explain the major components required for (SOEC) type Electrolyzer and discuss about each component.	3	-	-	-
	PC5. prepare and Identify Bill of material for materials and components of Electrolyzer manufacturing set up.	6	-	-	-
	PC6. explain the major components required for (AEM) type Electrolyzer and discuss about each component.	4	-	-	-
	PC7. outline differences in PEM, AE, Electrolyzer	-	8	-	-

	PC8. show how to identify Bill of material for materials and components of Electrolyzer manufacturing set up.	-	8	-	-
	PC9. showcase the successful case studies of Electrolyzer technology for Green Hydrogen generation in India and overseas.	-	8	-	-
NOS Total		20	30	-	-

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory	Practical	Project	Viva
SGJ/N4320: Perform Manufacturing Process of Electrolyzer	<i>Fundamental techniques and process for manufacturing Electrolyzer</i>	20	30	-	-
	PC1. identify and show different types of materials used in manufacturing electrolyzer.	2	6	-	-
	PC2. discuss about the electrolyzer cell components and its types and show them the electrolyzer cell components and its types through pictures and videos.	3	8	-	-
	PC3. discuss and show the process for membrane selection and Integration and how to select appropriate membrane for Electrolyzer manufacturing.	3	8	-	-
	PC4. discuss about the stacking techniques for electrolyzer manufacturing.	4	-	-	-

PC5. discuss about Emerging Manufacturing	4	-	-	-
PC6. discuss and show the scaling up and automation in electrolyzer manufacturing through pictures and videos.	2	8	-	-
PC7. discuss about the progress and Challenges in	2	-	-	-
<i>Assembling and Disassembling of Electrolyzer</i>	20	30	-	-
PC8. explain and show how to read and interpret drawings of electrolyzer manufacturing facility	3	6	-	-
PC9. discuss and show how to perform Cleaning and inspection of components of Electrolyzer for wear and tear.	3	6	-	-
PC10. discuss step by step process for assembly/Installation of Electrolyzer- Bipolar plate, separator(membrane), Porous Transport layer, electrodes etc	3	-	-	-
PC11. discuss and show the process of Membrane electrode assembly (MEA) handling and installation and process of membrane preparation through pictures and videos	3	6	-	-
PC12. discuss and show how to implement the procedure for Electrolyzer stack assembly.	3	6	-	-

	PC13. discuss the importance of Manifold and sealing in Electrolyzer Manufacturing	3	-	-	-
	PC14. identify and showcase the key aspects and learnings of successful cases studies of Electrolyzer manufacturing plants in India and abroad.	2	6	-	-
NOS Total		40	60	-	-

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory	Practical	Project	Viva
SGJ/N4321: Identify Tools and Tackles used in Electrolyzer Manufacturing Facility	<i>Introduction to Tools and Tackles used in Electrolyzer Manufacturing Facility</i>	25	25	-	-
	PC1. identify and illustrate the suitable tools and equipment required for electrolyzer manufacturing and classification of tools and tackles used in Electrolyzer Manufacturing facility.	2	2	-	-
	PC2. prepare List of common tools and tackles used in electrolyzer manufacturing facility.	-	4	-	-
	PC3. discuss and show the tools required for performing electrical and mechanical work for assembling electrolyzer and different types of tools and tackles used in electrolyzer manufacturing facility.	1	4	-	-
	PC4. explain Factors to be consider when selecting tools and tackles for Electrolyzer manufacturing facility.	2	-	-	-

PC5. explain method for care of tools and tackles	2	-	-	-
PC6. discuss the function and attribute of each tool.	2	-	-	-
PC7. explain and show Storage, maintenance and repair tools used in electrolyzer manufacturing facility.	1	4	-	-
PC8. explain and Prepare list of frequent problems encountered with tools and provide solutions for troubleshooting.	1	4	-	-
PC9. discuss Checking and detection of damaged tools.	2	-	-	-
PC10. explain Disposal of damaged or worn-out tools.	2	-	-	-
PC11. discuss the Importance of using the right tools and tackles for the job.	2	-	-	-
PC12. discuss do's and don'ts activity with the use of tools in electrolyzer manufacturing industry.	2	-	-	-
PC13. explain Safety considerations for using power tools in the electrolyzer manufacturing facility.	2	-	-	-
PC14. discuss about best practices for care and maintenance of tools and tackles used in Electrolyzer Manufacturing facility.	2	-	-	-

	PC15. identify and analyse the best practices for care and maintenance of tools and tackles used in Electrolyzer Manufacturing facility.in India and overseas.	2	3	-	-
	PC16. show importance of calibration and traceability of measuring instruments	-	4	-	-
NOS Total		25	25	-	-

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory	Practical	Project	Viva
SGJ/N4322: Perform Health and safety measures in Electrolyzer manufacturing facility	<i>Perform Health and safety measures in Electrolyzer manufacturing facility.</i>	25	25	-	-
	PC1. explain the requirements for safe work area at	2	-	-	-
	PC2. explain the importance of Occupational health & Safety standards and regulations for the safety of	2	-	-	-
	PC3. describe potential causes of emergency such as gas leaks, fire, explosion, bomb threatening, natural calamities etc.	2	-	-	-
	PC4. discuss importance of different detectors and safety tools used in Electrolyzer Manufacturing facility	2	-	-	-

PC5. review the Material Safety Data Sheet and labels of chemicals contained in cylinders in order to be aware of their hazards and precautionary measures	3	-	-	-
PC6. explain and demonstrate how to administer first aid and importance of first aid.	1	5	-	-
PC7. identify and demonstrate the usage of personal protective equipment for ensuring safety during manufacturing of Electrolyzer.	1	5	-	-
PC8. identify the hazards associated with Electrolyzer Manufacturing and show how to comply with all applicable statutory requirements along with safety regulations in terms of fire protection.	2	5	-	-
PC9. identify work safety procedures and instructions for working at Electrolyzer Manufacturing facility.	2	-	-	-
PC10. discuss Mock testing of firefighting system and demonstrate the use of fire extinguishers, fire detection and alarm system.	2	3	-	-

	PC11. discuss all applicable statutory requirements along with safety regulations in terms of fire protection and demonstrate how to follow necessary and adequate safety measures including personal protective equipment and precautions to avoid any accident at electrolyzer manufacturing site.	2	3	-	-
	PC12. incorporate and demonstrate good housekeeping and infection control & prevention practices.	2	2	-	-
	PC13. identify and showcase best practices for implementing health and safety measures in manufacturing of electrolyzer in India and overseas.	2	2	-	-
	PC14. demonstrate the use of fire extinguishers, fire detection and alarm system.	-	-	-	-
	PC15. demonstrate how to follow necessary and adequate safety measures including personal protective equipment and precautions to avoid any accident at electrolyzer manufacturing site.	-	-	-	-
	NOS Total	25	25	-	-

NOS/Module Name	Assessment Criteria for Performance criteria/Outcomes	Theory	Practical	Project	Viva
DGT/VSQ/N0102.Employability Skills (60 Hours)	<i>Introduction to Employability Skills</i>	1	1	-	-
	PC1. identify employability skills required for jobs in various industries	-	-	-	-
	PC2. identify and explore learning and employability portals	-	-	-	-
	<i>Constitutional values – Citizenship</i>	1	1	-	-
	PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others etc.	-	-	-	-
	PC4. follow environmentally sustainable practices	-	-	-	-
	<i>Becoming a Professional in the 21st Century</i>	2	4	-	-
	PC5. recognize the significance of 21st Century	-	-	-	-
	PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-

	<i>Basic English Skills</i>	2	3	-	-
	PC7. use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-
	PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
	PC9. write short messages, notes, letters, e-mails etc. in English	-	-	-	-
	<i>Career Development & Goal Setting</i>	1	2	-	-
	PC10. understand the difference between job and career	-	-	-	-
	PC11. prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-
	<i>Communication Skills</i>	2	2	-	-
	PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
	PC13. work collaboratively with others in a team	-	-	-	-
	<i>Diversity & Inclusion</i>	1	2	-	-
	PC14. communicate and behave appropriately with all genders and PwD	-	-	-	-

	PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
	<i>Financial and Legal Literacy</i>	2	3	-	-
	PC16. select financial institutions, products and services as per requirement	-	-	-	-
	PC17. carry out offline and online financial transactions, safely and securely	-	-	-	-
	PC18. identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
	PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
	<i>Essential Digital Skills</i>	3	4	-	-
	PC20. operate digital devices and carry out basic internet operations securely and safely	-	-	-	-
	PC21. use e-mail and social media platforms and virtual collaboration tools to work effectively	-	-	-	-
	PC22. use basic features of word processor, spreadsheets, and presentations	-	-	-	-
	<i>Entrepreneurship</i>	2	3	-	-
	PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-

	PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
	PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
	<i>Customer Service</i>	1	2	-	-
	PC26. identify different types of customers				
	PC27. identify and respond to customer requests and needs in a professional manner.	-	-	-	-
	PC28. follow appropriate hygiene and grooming standards	-	-	-	-
	<i>Getting ready for apprenticeship & Jobs</i>	2	3	-	-
	PC29. create a professional Curriculum vitae(Résumé)				
	PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
	PC31. apply to identified job openings using offline/online methods as per requirement	-	-	-	-
	PC32. answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
	PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
	NOS Total	20	30	-	-

Annexure: Assessment Strategy

This section includes the processes involved in identifying, gathering, and interpreting information to evaluate the Candidate on the required competencies of the program.

1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SDSM/SID or email
- Assessment agencies send the assessment confirmation to VTP/TC looping SCGJ
- Assessment agency deploys the ToA certified Assessor for executing the assessment
- SCGJ monitors the assessment process & records

2. Testing Environment:

- Confirm that the centre is available at the same address as mentioned on SDMS or SID
- Check the duration of the training.
- Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
- Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
- Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
- Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
- Check the availability of the Lab Equipment for the particular Job Role.

3. Assessment Quality Assurance levels / Framework:

- Question papers created by the Subject Matter Experts (SME)
- Question papers created by the SME verified by the other subject Matter Experts
- Questions are mapped with NOS and PC
- Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
- Assessor must be ToA certified & trainer must be ToT Certified

- Assessment agency must follow the assessment guidelines to conduct the assessment

4. Types of evidence or evidence-gathering protocol:

- Time-stamped & geotagged reporting of the assessor from assessment location
- Center photographs with signboards and scheme specific branding
- Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
- Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

5. Method of verification or validation:

- Surprise visit to the assessment location
- Random audit of the batch
- Random audit of any candidate

6. Method for assessment documentation, archiving, and access

- Hard copies of the documents are stored
- Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
- Soft copies of the documents & photographs of the assessment are stored in the Hard Drives

On the Job:

OJT Monitoring Report

- As in Green Jobs Sector, reproducing the evidence for assessment is not feasible due to constraints like cost, confidentiality and controlled environment, every
- Apprentice is required to record the evidences performed during the OJT and the same gets authorized by his/her supervisor.
- The evidence recording is done in a structured monitoring report, termed as OJT Monitoring report.
- During the OJT, every trainee is required to fill the OJT monitoring report which is required to be signed by his/her supervisor.
- Towards the end of OJT period these reports are submitted with the HR department of company
- These duly submitted reports are then verified by an Industry nominated assessor for verification of evidence.

Theory, Practical & Viva:

- Scope – Is used to test the knowledge and understanding and skills acquired during the OJT as well as to conform the OJT monitoring report.
- Some personality traits and generic skills (such as – promptness, sharpness, communication skills, depth of knowledge, comprehension,

- presentation, patience
- etc) can also be tested, which is also required for the QP.
 - Tools – The assessment's questions should be aligned with the Qualification Pack, covering the PCs. There will be summative assessment at the end of the OJT.
 - Method – Direct questions open and close ended questions, situation-based questions, analytical questions, and decision-making based questions for Viva,
 - MCQ for the theory and performing QP related operations for practical. Different questions in theory, practical and viva are included to test relevant PCs from
 - the QP
 - Analysis – Assessor draws a spectrum of ready answers to be expected from trainee for Viva. This reduces effect of subjectivity of the assessor. Comparative
 - Quality of trainees within a batch or different institutes can be gauged. The skill is gauged by observing the practical work.

Execution of OJT Assessment:

- HR department hands over the individual OJT monitoring report with Industry nominated assessor and schedules an assessment meeting for each trainee.
- Industry nominated assessor assesses each trainee based on OJT monitoring report, viva on each PC and also takes into account attendance of each trainee towards the end of the OJT period.
- The OJT marks are compiled for each NOS by the Industry nominated assessor and submitted with HR department of company.
- The OJT assessment results are then sent to SCGJ by HR department of company in a sealed envelope for compiling the assessment results in case of offline assessment.

Annexure: Acronym and Glossary

Acronym

Acronym	Description
AA	Assessment Agency
AB	Awarding Body
ISCO	International Standard Classification of Occupations
NCO	National Classification of Occupations
NCrF	National Credit Framework
NOS	National Occupational Standard(s)
NQR	National Qualification Register
NSQF	National Skills Qualifications Framework
OJT	On the Job Training

Glossary

Term	Description
National Occupational Standards (NOS)	NOS define the measurable performance outcomes required from an individual engaged in a particular task. They list down what an individual performing that task should know and also do.
Qualification	A formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards
Qualification File	A Qualification File is a template designed to capture necessary information of a Qualification from the perspective of NSQF compliance. The Qualification File will be normally submitted by the awarding body for the qualification.
Sector	A grouping of professional activities on the basis of their main economic function, product, service or technology.
Long Term Training	Long-term skilling means any vocational training program undertaken for a year and above. https://ncvet.gov.in/sites/default/files/NCVET.pdf

Annexure: Career Progression and OM

